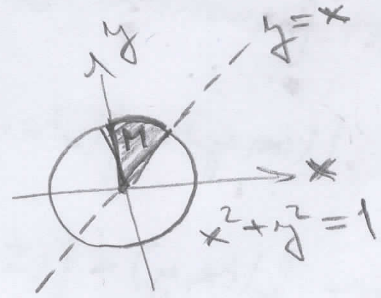
(2.) $$\iint_M \sqrt{\frac{4}{4-x^2-y^2}}\,dx\,dy = \int_0^1 \int_{\frac{\pi}{4}}^{\frac{\pi}{2}} \sqrt{\frac{4}{4-r^2}} \cdot r\,d\varphi\,dr =$$

POLAR COORDINATES : $\left| \begin{array}{l} x = r\cos\varphi \\ y = r\sin\varphi \end{array} \right|$

$J = r$

$M:\ 0 < x < y$

$x^2 + y^2 \le 1$



$$\boxed{\frac{\pi}{4} < \varphi \le \frac{\pi}{2}}$$

$$\boxed{0 \le r \le 1}$$

$$= \int_{\frac{\pi}{4}}^{\frac{\pi}{2}} 1\,d\varphi \cdot \int_0^1 \sqrt{\frac{4}{4-r^2}} \cdot r\,dr = \left(\frac{\pi}{2} - \frac{\pi}{4}\right) \cdot \int_4^3 \frac{2}{\sqrt{t}}\left(-\frac{1}{2}\right) dt$$

substitution : $\left| \begin{array}{l} 4 - r^2 = t \\ -2r\,dr = dt \end{array} \right|$

$r\,dr = \left(-\frac{1}{2}\right) dt$

$$= \frac{\pi}{4} \cdot \int_3^4 \frac{1}{\sqrt{t}}\,dt = \frac{\pi}{4} \cdot \int_3^4 t^{-\frac{1}{2}}\,dt = \frac{\pi}{4} \left[\frac{t^{\frac{1}{2}}}{\frac{1}{2}} \right]_3^4$$

$$= \frac{\pi}{4} \cdot 2 \cdot \left(4^{\frac{1}{2}} - 3^{\frac{1}{2}}\right) = \frac{\pi}{2} \cdot \left(2 - \sqrt{3}\right) = \underline{\underline{\pi \cdot \left(1 - \frac{\sqrt{3}}{2}\right)}}$$